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# **The Importance of Proper Positioning for Airway Management for Obese Patients**

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Additional information is available at the end of the chapter

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## **Abstract**

In the practice of anesthesia patient care, airway management is the first and most important consideration when caring for all patients. In particular, when caring for obese patients, airway positioning requires additional special attention. The head-elevated laryngoscopy position (HELP) has been presented as the best starting point to improve patient safety, lower risk, and facilitate a successful first attempt at intubation. HELP has also been described as the ramped position.

**Keywords:** obese patients, airway management, airway positioning, HELP, patient safety, intubation, ramped position

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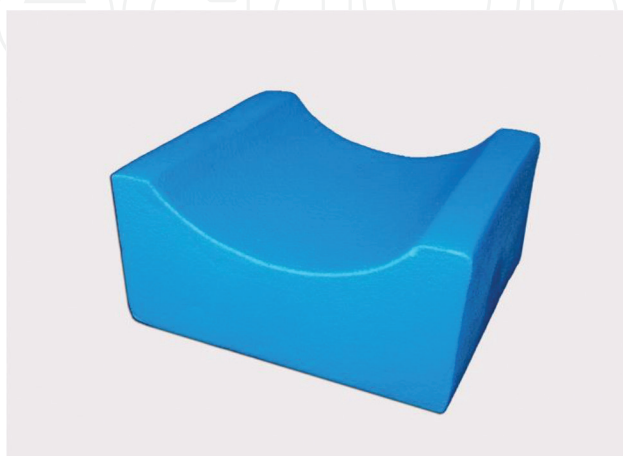
## **1. Introduction**

The problem of obesity (BMI > 30) and morbid obesity (BMI > 40) is now of global proportions. The term globesity has been described! It is not the intent of this chapter to address the etiology or reasons for this current clinical issue. Rather, what is presented is a review of concepts and studies that support an adjustment in clinical anesthesia practice to more safely care for the airway of obese and morbidly obese patients. A simple yet highly effective method to lower risk, improve patient safety, and facilitate airway management is to place large patients in a ramped position for all surgical/anesthesia cases (regional and general). The objective of this chapter can be stated in one sentence. If you are caring for a large, obese/morbidly obese patient, first pay attention to positioning.

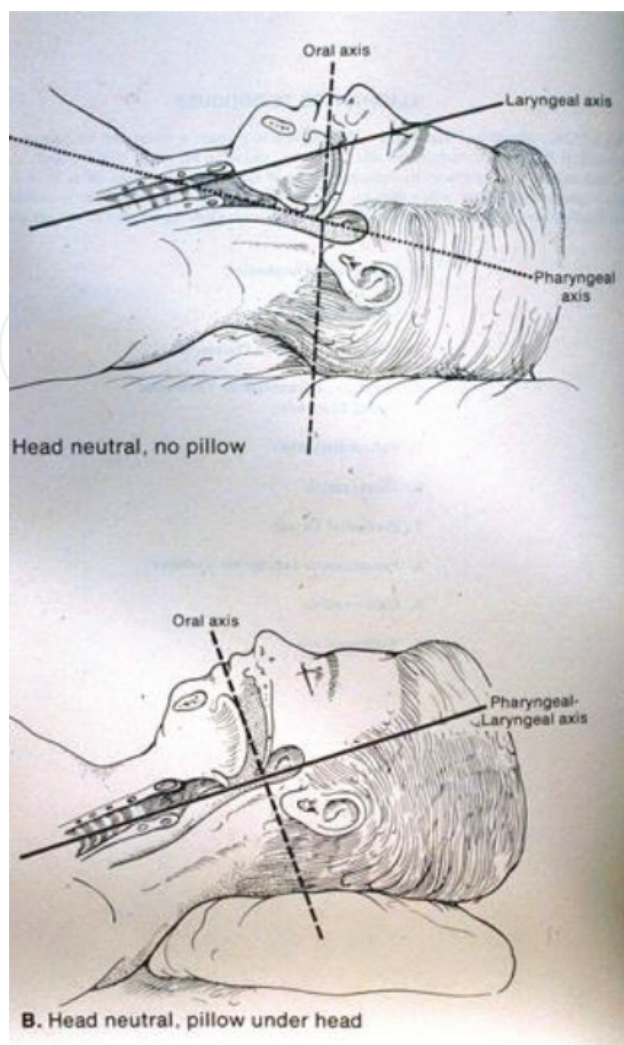
## 2. Positioning the obese and morbidly obese patient and airway management

Several articles and textbook writings [6, 7, 8, 9, 10] are available that address the numerous medical concerns when caring for obese patients. It is well accepted that these patients present an increased risk for perioperative morbidity. A partial list of these concerns includes cardiovascular disease (increased cardiac workload, arrhythmias), hypertension, obstructive sleep apnea (OSA) [13], restrictive and reactive lung disease (asthma, chronic hypoxemia, and hypercarbia), and abnormal pulmonary mechanics. The functional residual capacity (FRC) (volume of air that remains in the lungs after a normal breath) decreases in proportion to increasing BMI. Total lung capacity (TLC), forced expiratory volume (FEV), forced vital capacity (FVC), and ratio of FEV to FVC decrease with a BMI > 35. Increased intra-abdominal pressures cause a restrictive pattern that is worsened by a supine position. Simple questioning of the obese/morbidly patient will often reveal that the patient (at home) never lies in a fully supine position but rather sleeps on several pillows or in an extreme case sleeps in a recliner chair. Common sense would suggest that placing these patients in a fully supine position prior to the induction of artificial sleep (anesthesia) is not a good practice. Proper positioning of the obese/morbidly obese patient is a patient safety issue. When caring for the airway of normal-size nonobese patients, the concept of aligning the three airway axes in preparation for intubation has been taught at all anesthesia teaching colleges. Simply put, to facilitate placement of the endotracheal tube, one needs to align the oral, the pharyngeal, and the laryngeal axis to improve the “line of site” from the mouth to the trachea.

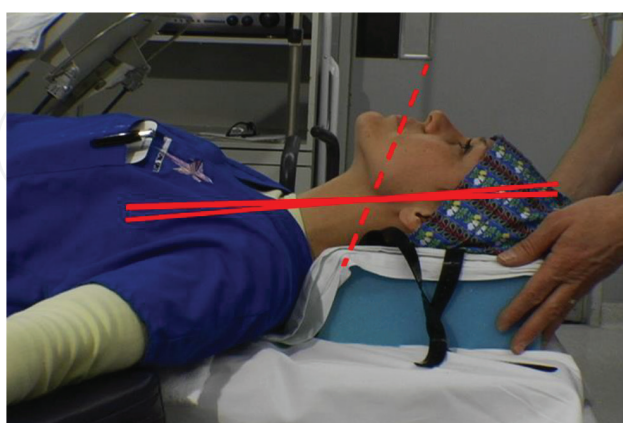
A small standard foam head cradle (**Figure 1**) placed behind the patient’s head will put the cervical spine in a slight amount of flexion and brings the oral and pharyngeal axes into alignment (**Figures 2 and 3**). Following this, simple extension of the patient’s head will aid in alignment of all three airway axes in the majority of normal-size patients. Another way to describe this airway axis alignment is to position the patient such that an imaginary line from the patient’s ear (external auditory meatus) to the suprasternal notch (top of the breast bone) is approximately parallel to the OR table. **Figure 4** shows the white imaginary line as an acute angle and the airway axes misaligned. In order to align the three airway axes of the obese/morbidly obese



**Figure 1.** Standard head cradle or head rest.

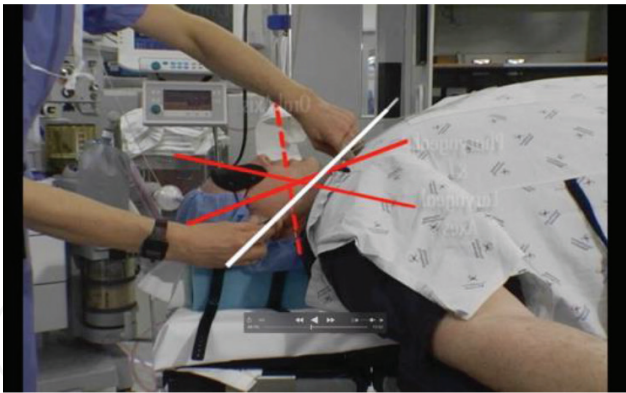


**Figure 2.** Airway axes.



**Figure 3.** Normal-size person on head cradle with superimposed airway axes.

patient, a standard small head cradle by itself is not sufficient [3] (**Figure 4**). However, simply placing a standard head cradle on a ramp constructed from a stack of blankets “stacking” (**Figure 5**) or the use of a specially sculptured foam ramp (**Figure 6**) will achieve the desired



**Figure 4.** Obese patient. Airway axes misaligned. Lying only on a standard head cradle.



**Figure 5.** Well positioned on a “stack” of blankets. Obese patient on a ramp of blankets + head cradle.



**Figure 6.** Troop elevation pillow (TEP) with standard head cradle (note the elevated arm board pads).

result. This stacked position could be described as the “blessing of the blankets” (**Figure 5**) and (Video #1 Supine vs. ramping with blankets).

This simple and easy step or adjustment when caring for the airway of obese and morbidly obese patients has significant clinical benefits (**Table 1**).



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Improved ease of breathing = less anxious patient prior to induction of GEA
Better preoxygenation = increased time to desaturation
Easier to mask ventilate the patient and also to rescue ventilate if difficult intubation occurs
Improved line of sight facilitates successful first-pass intubation [direct laryngoscopy (DL) or video laryngoscopy (VL)]
Helps to align the three airway axes (a simple adjustment of the OR table; backup or reverse Trendelenburg does not change airway axis alignment) (see Video # 1 Supine vs. ramping with blankets)

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**Table 1.** Benefits of the ramped position.

This position is perhaps better described by the term head-elevated laryngoscopy position (HELP). This term was described by Levitan [5] in 2003.

Many objective clinical reports support placing the obese patient in a ramped position prior to anesthesia induction. A common subjective remark from the obese patient when placed in a fully supine (flat) position on the OR table is “I cannot breathe like this” (**Figure 7**) (Video #2 Positioning: good for the patient). As previously mentioned, morbidly obese patients (when at home) tend to sleep elevated on several pillows. Such patients understandably are anxious when lying fully supine as the work of breathing increases.

Numerous formal studies also confirm that HELP ramping or stacking the obese patient is of clinical benefit. Two studies are most noteworthy:

1. **Collins et al. Laryngoscopy and morbid obesity** [1]. This study from 2004 demonstrated that the “stacked,” “ramped,” or “head-elevated laryngoscopy position” (HELP) improves pulmonary compliance, allows easier mask ventilation, and improves conditions for tracheal intubation.
2. **Dixon et al. Preoxygenation is more effective in the 25° headup position than in the supine position in severely obese patients** [2]. This study from 2005 demonstrated a significant increase in the desaturation safety period postanesthesia induction allowing for a greater time for intubation and airway control.

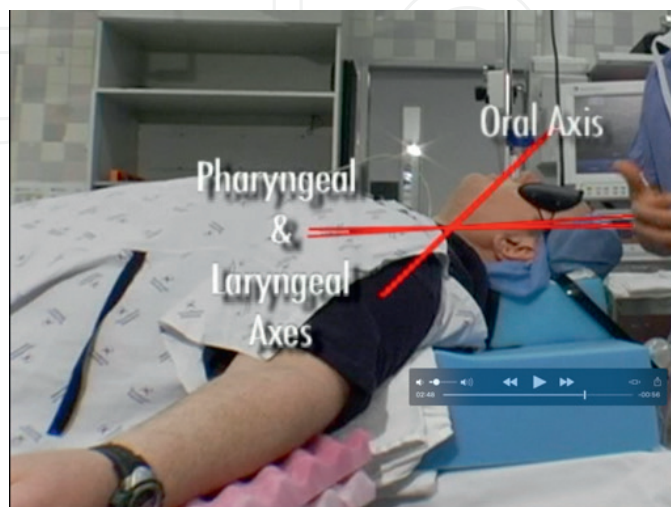


**Figure 7.** Fully supine obese patient on a standard head cradle only.

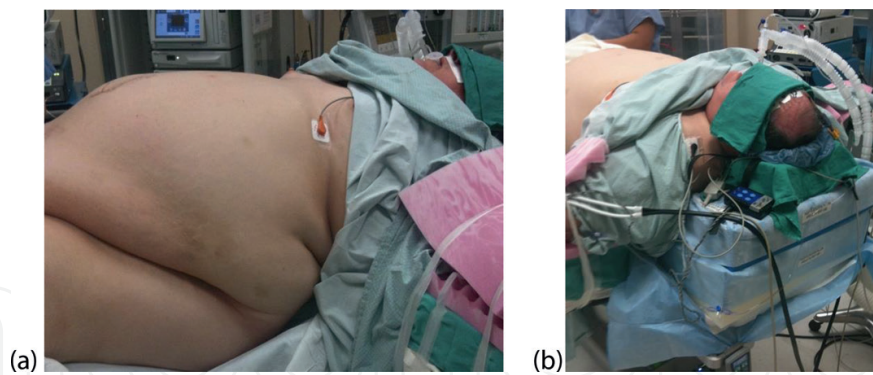
To state the obvious, patients are not all the same size and shape. It is well accepted that surgical positioning is adjusted or modified (depending on the type of surgery). Likewise, special attention should be given to airway management for the obese, morbidly obese, or very large patient [14]. Starting from the head-elevated laryngoscopy position (HELP) will aid in better alignment of the three airway axes (**Figures 8** and **10**) and help to isolate the patient's airway above the level of the chest and abdomen. This elevated position is of benefit for the obese patient prior to anesthesia induction as he/she will breathe with greater ease (Video #2 Positioning: good for the patient). The patient will be less anxious but of even more clinical significance is the improvement in pre-oxygenation as mentioned above. An increase in the desaturation safety period is of profound importance. This period is the time from the onset of apnea (not breathing) until the patient's blood oxygen "level" begins to drop. Clinically, the SpO2 monitor (%) value and tone begin to fall precipitously (Video #2 Positioning: good for the Patient). The anesthesia provider must initiate breathing for the patient to avoid a crisis. The anesthesia clinician will benefit as HELP will facilitate easier mask ventilation [17]. Further, the head-elevated position results in a greater incidence of a successful first attempt at intubation [1, 4, 11, 17, 18].

Although proper positioning of the high-risk patient is taught at virtually all anesthesia training programs, many anesthesia providers in a private clinical practice setting do not follow the advice. The reasons for this are varied, but perhaps the two most common reasons for not focusing on good positioning are that building a ramp from a stack of blankets takes too much time and is inherently unstable. Another common remark is "...we have a videoscope; we do not need to ramp our obese patients." This is a misconception as good positioning will facilitate all methods of airway management (mask ventilation, DL, VL, LMA, etc.) [17]. In an effort to encourage today's anesthesia providers to always properly position their obese patients, commercially available foam ramp-shaped positioners have been developed (**Figures 6** and **8**) (Video #3 TEP overview).

This foam positioning device known as the Troop Elevation Pillow (TEP) (**Figure 6**) is **easy** to set up and use. It is very **stable** (unlike a pile of blankets), and the TEP yields a **predictable** result with each use. There are other commercially developed positioners, but the TEP is perhaps the most studied for use in clinical practice [12, 15, 16].



**Figure 8.** Morbidly obese patients lying on TEP + head cradle/airway axes are beginning to align.



**Figure 9.** (a) Super morbidly obese patients BMI > 50; (b) well positioned on TEP + addition + head cradle.



**Figure 10.** Morbidly obese patient, 6 foot 375 pounds: bad vs. good airway positioning.

Super morbidly obese patients (BMI > 50) require additional ramping (**Figure 9(a)** and **(b)**) (Video #4 Super morbidly obese and TEP addition).

### 3. Conclusion

All obese and especially morbidly obese patients will benefit from the head-elevated laryngoscopy position (HELP) or ramped position. This is applicable for regional anesthesia cases (surgery under spinal, epidural, or local anesthesia with sedation) [16] as the ease of spontaneous ventilation is improved. For general endotracheal anesthesia cases (GEA), the head-elevated laryngoscopy position is a much improved starting “point” for airway care as the position will compliment all methods and techniques of managing the patient’s airway. The position facilitates a successful first attempt at intubation. As stated in the introduction, the intent of this chapter is to reveal why proper positioning of the obese/morbidly obese patient is so important. **It is a patient safety issue.** The old saying that a picture tells a thousand words is captured in **Figure 10**, a side-by-side comparison of bad and good positioning. As stated in



the introduction, the objective of this chapter is to convey one simple message: **If you are caring for a large, obese/morbidly obese patient, you should first pay attention to positioning.**

## Conflict of interest

The author is the inventor and developer of the troop elevation pillow (TEP). The TEP has been offered by several medical distribution companies around the world since 2005.

## Acronyms and abbreviations

BMI	body mass index (a ratio of the patient's weight in kilograms divided by height in meters squared).
DL	direct laryngoscopy.
GEA	general endotracheal anesthesia.
HELP	head-elevated laryngoscopy position.
Induction of anesthesia:	the administration of an anesthetic or causing an anesthetic state.
LMA	laryngeal mask airway.
SpO <sub>2</sub>	an indirect noninvasive measurement of the oxygen level (oxygen saturation) of the blood.
Preoxygenation:	prior to the administration of anesthesia, the surgical patient breathes on a mask and circuit of oxygen to increase the O <sub>2</sub> content in the lungs and in the circulation.
VL	video laryngoscopy.

## Videos

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